CARDIAC

CARDIAC EMERGENCIES/CHEST PAIN

a. **ABC's**
b. **100% oxygen**, assist ventilations if needed.
c. Obtain patient history.
    i. Patient's past medical history (Heart attack, cardiac, stroke)
    ii. The location and type of pain.
    iii. Does the pain radiate down the arms or to the jaw, abdomen, or back.
    iv. Severity of the pain. ("X" out of 10 scale may be helpful).
    v. Factors that aggravate or alleviate the pain.
d. Patient's general appearance, level of consciousness.
e. **Vital signs**.
f. Cardiac **monitor**, Pulse oximeter.
g. **IV** access.
h. If cardiac pain is suspected; **Aspirin** 160-320mg, **Nitroglycerin** 0.4 mg sublingual or metered spray - may be repeated twice at 5-minute intervals if not hypotensive (BP < 90 systolic).
i. Additional **Nitroglycerin**
j. **Morphine** 2-3 mg IV titrate to a maximum of 15 mg
k. **Contact Medical Control**.

l. Medical Control Options:
    i. Divert to closest hospital only if patient is unstable Priority 1 as defined in Protocol #1.
    ii. A fluid bolus (500 ml in adults) if hypotension is caused by either **nitroglycerin or morphine**
    ii. Alert receiving ED of high-risk patient

ASYSTOLE

a. Confirm cardiac arrest (unresponsive, pulseless, breathless, no evidence of trauma)
b. A full two minutes (5 cycles) of C.P.R. (one cycle of CPR: 30 compressions then 2 breaths) must be performed with minimal interruptions in chest compressions (Ventilate with **100% oxygen** **AVOID HYPERVENTILATION—8-10 BREATHS PER MINUTE**)
c. Cardiac **monitor** or paddle pick-up
   i. Asystole (confirmed in 2 leads. If suspect fine V-Fib, use V-F protocol)
   ii. Continue CPR immediately for 5 cycles
   iii. ***Check for EMS/DNR bracelet, DNR order, or signs of obvious death. Confirm with medical control as per Death Protocol and discontinue resuscitation.***
   iv. Intubate, **100% oxygen**, **IV/IO LR/NS** TKO, after airway is secured, give continuous chest compressions—check rhythm every 2 minutes
   v. **Epinephrine**, 1:10,000, 1.0 mg IV/IO (repeat every 3-5 minutes) or 1 dose of **vasopressin** 40 U IV/IO to replace the 1st or 2nd dose of **epinephrine**
   vi. Consider **Atropine**, 1.0 mg IV/IO (may repeat 1.0 mg IV/IO in 3-5 minutes, 0.04 mg/kg maximum)
   vii. **Contact Medical Control**
   vii. Transport to the closest hospital ***or terminate resuscitation as directed.***

   **** If converted to another rhythm use appropriate protocol***

d. Medical Control Options
   i. Terminate resuscitation if no spontaneous pulse restored with 30 minutes of ACLS measures, and no reversible cause suspected.
e. Notes of Concern
   i. Antecubital or external jugular veins are the peripheral veins of choice due to a more rapid access to the central circulation
   ii. Asystole is a common rhythm after defibrillation. Continue CPR for immediately for 5 cycles.
   iii. Before defibrillation of fine V-fib, be sure to check lead attachment, monitor switch, and paddle vs. lead II switch, to eliminate chance of artifact
   iv. Should IV access be unavailable, endotracheal medication administration routes should be used (epinephrine, atropine, at doses 2 times the IV dose ***diluted to 10ml in NS***.
   v. IO administration of medication should be considered in a patient in full arrest.
   vi. Consider: Hypovolemia, Hypoxia, Hydrogen (Acidosis), Hypo-or HyperKalemia, Hypoglycemia, Hypothermia
   Toxins, Tamponade, Tension Pneumothorax, Thrombosis (coronary or pulmonary), Trauma

VENTRICULAR FIBRILLATION/PULSELESS VENTRICULAR TACHYCARDIA

a. Confirm Cardiac Arrest (unresponsive, pulseless, breathless, no evidence of trauma)
b. Witnessed Arrest: if EMS witnessed or less than 4 minutes estimated down time, go to c.iii.
c. Un-witnessed
   i. Check pulse, if absent, do paddle pick-up
   ii. Begin CPR (30 compressions to 2 breaths for 5 cycles (2 min.) Ventilate with **100% oxygen**—8-10 breaths per minute (DO NOT HYPERVENTILATE)
   iii. Presenting V-Fib or pulseless V-Tach
      a) **Defibrillate at 360J or biphasic 200J*** (or manufactures recommendation) (continue CPR while charging)
      b) After shock, resume CPR
      c) If no conversion, CPR, intubate ***(confirm placement),*** **IV/IO LR/NS** TKO, ventilate with **100 % oxygen-8-10 breaths per minute**
      d) **Epinephrine**, 1 mg IV/IO or ET repeat every 3-5 minutes during arrest--) or 1 dose of vasopressin 40 U IV/IO to replace the 1st or 2nd dose of epinephrine
      e) **Defibrillate at 360J or biphasic 200J*** (or manufactures recommendation)
      f) **Lidocaine** 1-1.5 mg/kg IV may repeat dose in 3-5 minutes @ .5-.75 mg/kg
      g) **Defibrillate at 360J** or **biphasic 200J*** (or manufactures recommendation)
      h) **Sodium Bicarbonate** 1mEq/kg IV (consider if down time is 10 or more minutes)
      i) Repeat **Lidocaine**, continue defibrillation enroute
      j) **Contact Medical Control**
      k) Transport to the closest hospital or terminate resuscitation as directed.

If conversion to another rhythm use appropriate protocol

d. Medical Control Options
   i. Terminate resuscitation if no spontaneous pulse restored with 30 minutes of ACLS measures.
e. Notes of Concern
   i. Circulate medications for one minute prior to defibrillation. Flush with at least 10 cc of IV solution, and elevate the extremity.
   ii. Antecubital or external jugular veins are the peripheral veins of choice in cardiac arrest.
   iii. Early defibrillation is the most important factor in the successful resuscitation of cardiac arrest.
   iv. If IV access is unavailable, the use of the endotracheal tube for medication route should be considered. Use only with Epinephrine, Atropine, and Lidocaine at 2 times the IV dose ***diluted to 10ml in NS.***
   v. Begin a **Lidocaine** drip 2-4mg/minute following conversion.
   vi. **Lidocaine** therapy is contraindicated in the following:
      a) Bradycardia and heart blocks
      b) Wide complex ***ventricular bradycardia***
      c) **Lidocaine** may suppress a ventricular escape rhythm and induce Asystole.
      d) Use 1/2 dose of **Lidocaine** for elderly, liver, and kidney patients
   vii. It is important to note whether CPR was started and what time prior to ALS or BLS arrival
   viii. IO administration of medication should be considered in a patient in full arrest.
   ix. Pre-cordial thump-no recommendation can be made for or against its use by ACLS providers (Class Indeterminate)

PULSELESS ELECTRICAL ACTIVITY (PEA)

a. Confirm Cardiac Arrest (unresponsive, pulseless, breathless)
b. Begin CPR (30 compressions to 2 breaths for 5 cycles (2 min.) Ventilate with **100% oxygen**—8-10 breaths per minute (DO NOT HYPERVENTILATE)
c. Cardiac Monitor: PEA (any rhythm except ventricular Tachycardia without a palpable pulse)
d. Intubate, **IV/IO LR/NS** TKO
e. Look for underlying causes:
    i. Hypovolemia
        a) **Fluid challenge** 500cc, pediatric dose 20cc/kg
        b) Second fluid challenge 500cc, pediatric dose 20cc/kg
    ii. Hypoxia (**100% O_2** by ET)
    iii. Hydrogen ion – acidosis (consider **sodium bicarbonate** 1 mEq/kg IV)
    iv. Hyperkalemia (renal failure)
        a) consider **sodium bicarbonate** 1mEq/kg
    v. Hypoglycemia
    vi. Hypokalemia
    vii. Hypothermia (refer to hypothermia protocol, page 27)
    viii. Tablets/toxins (drug OD, accidents)
    ix. Tamponade, cardiac (**fluid challenge** as previously detailed)
    x. Tension pneumothorax (**needle decompression**)
    xi. Thrombosis, coronary
    xii. Thrombosis, pulmonary (embolism) (**fluid challenge** as previously detailed)
    xiii. Trauma
f. Drug therapy while considering causes
    i. **Epinephrine 1:10,000** 1mg IV/IO push, ET (2-2.5 x dose in ET tube), repeat every 3-5 minutes
    ii. Consider **Atropine 1mg** IV/ET/IO IF RATE IS SLOW FOR AGE, every 3-5 minutes, to maximum total dose of 0.04 mg/kg (that would be 3mg for a 70kg patient)
g. **Contact Medical Control**
h. Medical Control Options:
    i. Transport to closest appropriate facility or terminate resuscitation if no spontaneous pulse after 30 minutes of ACLS measures
    ii. Consider: Hypovolemia, Hypoxia, Hydrogen (Acidosis), Hypo-or HyperKalemia, Hypoglycemia, Hypothermia
    Toxins, Tamponade, Tension Pneumothorax, Thrombosis (coronary or pulmonary), Trauma

STABLE / UNSTABLE-TACHYCARDIA

a. Cardiac **Monitor**, analyze rhythm. Confirm tachycardia, rate > 150 (see notes of concern).
b. Check oxygen saturation on room air, consider applying oxygen supplementation if SaO_2 < 90%.
c. Establish **IV** LR or NS TKO
d. Evaluate patient stability
   i. **Stable** (patient conscious and alert, systolic BP>90, no chest pain or pulmonary edema)
      a) Valsalva maneuver.
      b) **Contact Medical Control for possible Adenosine use**
      c) If patient has history of PSVT and has responded to **Adenosine** in the past, consider **Adenosine** administration (see below).
      d) If patient has no prior history of PSVT, **Adenosine** is contraindicated for field use. Atrial fibrillation, atrial flutter, multifocal atrial tachycardia, junctional tachycardia, ectopic atrial tachycardia, sinus tachycardia due to other medical conditions are examples of SVT not responding to adenosine.
      e) Transport patient to hospital.

   iii. **Unstable** (decreased consciousness, systolic BP<90, chest pain, or pulmonary edema and arrhythmia is the suspected cause.
      a) If patient is conscious and alert, consider sedation.
         i) Consider **Midazolam intranasal** (Only if patient is not in extremis or deteriorating): inspect nostrils for mucus, blood or other problems, which might inhibit absorption. Draw 0.2 mg/kg up to 10mg of 5mg/ml solution for delivery by atomizer device. Give ½ of volume in each nostril.

         Pediatric kg. Weight estimation: 10 + (2 X Age in years)

         ii) If no response to intranasal **Midazolam** in 5 minutes, give IV dose
         iii) Intravenous: 0.1 mg/kg up to 5mg of 5mg/ml solution, inject slowly until patient calm, speech slightly slurred. Be prepared to support ventilation if needed.
      b) Adult cardioversion
         i) Synchronized Cardioversion at 100J or biphasic 75J*
         ii) Contact Medical Control after 1st cardioversion attempt (adult or pediatric)
         ii) Synchronized Cardioversion at 200J or biphasic 120J* (or manufactures recommendation)
         iii) Synchronized Cardioversion at 300J or biphasic 150J* (or manufactures recommendation)
         iv) Synchronized Cardioversion at 360J or biphasic 200J* (or manufactures recommendation)
      c) Pediatric cardioversion
         i) Synchronized cardioversion at 0.5-1 J/kg (double for 2nd and subsequent cardioversions)

When converted, use appropriate protocol.

e. **Adenosine** administration for suspected PSVT
   i. Usual dosage: 6 mg IV bolus. If conversion unsuccessful, a 12 mg bolus may then be administered.

ii. Choose the most proximal IV site, preferable antecubital. Make sure there are at least two medication ports in line.
iii. Prepare prior to administering.
iv. One syringe with 6 mg or 12 mg **Adenosine**
v. One syringe with 20 cc **LR or NS**
vi. One paramedic will elevate the IV site above the heart and administer the **Adenosine** through the most proximal port. Immediately afterward, a second paramedic will administer 20cc **LR or NS** flush through the more distal port.
vii. Record the cardiac rhythm during conversion attempt(s).

f. Notes of concern:
    a. Tachycardia may be compensatory in hypovolemis, shock, sepsis, etc. Consider non-cardiac causes of tachycardia that should not be treated as a primary arrhythmia.

SYMPTOMATIC BRADYCARDIA (patient not in arrest)

a. Assessment shows bradycardia (pulse less than 60 in adults, or less than age corrected minimum in children) AND..... SERIOUS signs or symptoms: chest pain, shortness of breath, decreased level-of-consciousness, hypotension, shock, or dyspnea with rales
b. **100% O^2, IV LR or NS TKO, monitor**. Correct hypoventilation and secure airway as needed. Supine position.
c. Apply transcutaneous pacer electrode patches.
d. **Initiate pacing**
    i. Consider sedation in alert patients:
        a) Consider **Midazolam** intranasal: inspect nostrils for mucus, blood or other problems, which might inhibit absorption. Draw 0.2 mg/kg up to 10mg of 5mg/ml solution for delivery by atomizer device. Give ½ of volume in each nostril.

        Pediatric kg. Weight estimation: 10 + (2 X Age in years)

        b) If no response to intranasal Midazolam in 5 minutes, give IV dose as below:
        c) Intravenous: 0.1 mg/kg up to 5mg of 5mg/ml solution, inject slowly until patient calm, speech slightly slurred. Be prepared to support ventilation if needed.
    ii. Set desired rate (usually 80 in adults), gradually increase output setting until capture achieved (confirmed by palpable peripheral pulse of 80).
    iii. Pediatric pacing only if proper sized electrodes available.
    iv. Request sedation as above if alert patient is uncomfortable after capture.
e. **Atropine** 0.5 mg (0.02 mg/kg pediatric: only after O^2 and ventilation corrected) only if pacing delayed. Contraindicated in high degree AV block and 3º degree block.
f. Asymptomatic patients may not require treatment. Cardiac monitor only
g. **Contact Medical Control**.
h. Transport to closest appropriate hospital
i. Medical Control Options
    i. Repeat atropine in 3-5 minutes